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Impact of rural land certification on farmers' investment for soil and water conservation activities in Soddo Zuriya Woreda, Southern Ethiopia

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ABSTRACT

Land degradation is severe phenomena threatening economic development in Ethiopia due to lack of feasible land uses policy and plan. Land is owned by government and its people in whom tenure insecurity resulted into frequent land redistribution, eviction from holdings and limited land rights during the past regimes. Lack of tenure security impacted the farmers' investment for land management practices. This study aimed at investigating the impact of rural land registration and certification program on farmers' investment for soil and land management practices. A total of 149 households were selected from three Kebeles based on probability proportional to sample size determination for data collection. Quantitative data were collected from sampled households using structured questionnaire whereas the qualitative data were generated from focus group discussions, key informants' interviews and field observation. Descriptive statistics were used to summarize the data analyses. The result showed that in Soddo area the gender imbalance in land ownership has significant impact contributing to the investment on the soil and water conservation. The employment and adoption of both physical and biological measures of soil and water conservation practices directly linked with the gender-based land ownership which also is related to the difference on physical labor and power of men and women. The land ownership modality and gender based and joint land certification holding is quite important for the proper employment of family labor. The adoption and non-adoption of both physical soil and water conservation activities is not related with the family size rather it is impacted by the land size owned by the house holds. However, the adoption and non-adoption of biological soil and water conservation activities is related with the mean family size. Both female and male family members are responsible and create assurance of joint land certification for better employment of soil and water conservation practices and adoption of land management practices. Rural land certification and registration program has initiated the rural community for better investment in both physical and biological soil and water conservation activities basically on the technologies of drainage ditches, soil bund, contour sloughing, distribution of manure, application of compost, application of inorganic fertilizer,

and planting of trees has brought significant impact on land investment. The proportion of the house hold respondents who employed all technologies of biological and physical soil and water conservation measures are significantly higher after the land certification program than before. The chi-square result (χ2=29.717 and P< 0.01) shows there was statistically high significant difference before and after land certification. Thus, land tenure security, demographic, economic and communication variables of the households should give more emphasis making interventions in land management at farm level. Findings of the study indicated the land certification program significantly impacted the rate of investment on soil and water conservation activities in which small holder land ownership has proved better land management than communal land ownership as tenure security.

Keywords: Certification, Land, Registration, Soil and Water Conservation and Tenure Security

1. INTRODUCTION

Climate change and land degradation are severe phenomena of our globe which greatly impacted the sustainable economic development in African countries (Abebaw et al., 2011). Basically, lack of feasible land policy and appropriate land use plan has exacerbated land degradation in Ethiopia (Amsalu and Graaff, 2007). Land degradation is manifested by deterioration of physical, biological and chemical fertility of land (Bell, 2006). Soil and water erosion is principally causing the continuous degradation of land resources (Nega et al., 2003).

Majority of the population resides in rural areas are dependent on land for their livelihoods without employing sustainable conservation efforts on soil and water resources (Nega et al., 2003). Hence, the economic development is threatened by decline of agricultural productivity due to land degradation and soil fertility loss. FAO, (2002) indicated that land tenure is a relationship built among legally or customarily defined people as individual or group with respect to land. Land tenure is an institutional created mandate correlated with rural communities to administer the land resources (Yirga, 2008).

The institutional mandate of land tenure defines how property rights of a land are allocated within societies and the access granted to land rights for use, control and transfer land, as well as associated responsible and restrictions (Crewett et al., 2008). Land tenure is structured to secure access to the productive capabilities of the land or other uses over the land (Bell, 2006). Land tenure history in Ethiopia has changed radically in the past four decades through transforming from feudal system that recognizes kinship of tenant to land lord relationship to socialism which abolished the feudal system and declared public ownership of rural and distribution of private lands to the land tillers (Eleni, 2008).

The proceeding government in 1991 followed market-oriented economy although which land is still under the public ownership and had constitutionally fixed rights of ownership (Gobena, 2010). The system of rural land tenure of the country progressed under the different regimes exhibited persistence of problems that hinder access to land and hampering the sustainable land conservation (Ersado et al., 2004) Prior to the 1975, land reform is made for land tenure in Ethiopia that was characterized by a complex system of ownership, namely communal, church ownership, private and state holdings (Adal, 2003).

State or government holdings were most prevalent in less densely populated and pastoral areas of lowlands, irrespective of the geographical location, whereas communal ownership locally referred as “Rist” and church holdings characterized the northern highlands including Gojam, Gonder, Tigray and parts of Wollo Sub-regions (Gobena, 2010). The major form of land ownership was is the rist system in which all descendants both male and female as an individual founder were entitled to a share and had the right to use a plot of family land (Gabreselassie, 2006).

Rist was recognized as hereditary, inalienable and inviolable land ownership that can be transferred through land lord ownership system which declares no user of any piece of land could sell his or her share outside the family consent (Tadele, 2011). It is also manifested as neither could he or she mortgage nor bequeath the share as a gift or as the land belonged not to the individual but to the descent group (Rahmato, 2007). Most peasants in the northern highlands of Ethiopia historically held at least some rist land (Adenew and Abdi, 2005).

Gult, a form of private ownership, prevailed mainly in the southern regions, consisting of large holdings granted by the emperor or provincial authorities (Heyi, 2012). Owners were entitled to collect taxes or labor service from tenant farmers to some of whom had been cultivating the same land under customary or community-property rights (Tesfaye and Lemi, 2004). Gult rights were often provided in lieu of salaries to imperial officials and soldiers (Bekele and Drake, 2003). The Gult system was characterized by greatly concentrated landholdings and absentee ownership, political patronage and widespread share-cropping under penurious terms (Qoricho, 2011).

Owners could lease, sell, or mortgage land while tenants were subject to numerous restrictions, steep taxes, mandatory labor services and arbitrary eviction (Ayele, 2008). All Gult rights were abolished by the Derg and tenants were entitled to claim the lands that were not reallocated as state farms (Crewett et al., 2008). In the southern part of Ethiopia, private ownership of land was developed as a result of land grants by the government to loyalists of the imperial regime (Pound and Jonfa, 2005). This has resulted in land concentration in the hands of a few individuals subjecting the cultivators of the land to treats of arbitrary eviction and an exploitative landlord-tenant relationship (Holden and Yohannes, 2002).

The land tenure system during the imperial regime, therefore, did not provide enough incentives for the cultivators to manage land in a more sustainable manner. Church land was another important variant of the landholding system during the imperial regime that fixed ownerships to members of the nobilities, relations and church systems. For instance, Samon, Mengist and Maderia land were some of the names given to landownership types that Samon was land the government had granted to the Ethiopian Orthodox Church in perpetuity (Berhanu and Feyera, 2005).

Following the overthrow of the imperial government and establishment of the military regime in 1974, the military regime issued the land reform Proclamation of February 1975, formally known as the "Public Ownership of Rural Lands Proclamation" (Deininger and Jin, 2006). This proclamation nationalized all rural land and ended all forms of tenancy (Tesfaye and Lemi, 2004). Peasant associations were established which were bestowed with administering land markers (Dagnew et al., 2009). Consequently, the peasant associations distributed land to farm households based on family size with little regard to other factors such as resource endowment including oxen ownership, adult labor and working capital (Habtamu, 2006).

The new land tenure system provided farmers with restricted rights, prohibiting the transfer of holdings in any form including inheritance, renting, share-cropping or gift (Girma, 2000). Land was frequently re-distributed in order to reduce landlessness, as well as to address land quality differences until 1990, which had the effect of leveling down differences in land holdings and reducing land allotted to community forests and grazing (Adal, 2000). Moreover, smallholder farmers were also evicted from their holdings to give way for state farms and producer cooperatives formation (Federal Democratic Republic of Ethiopia, 2005).

Many African countries have recently changed their land legislation or institutional setup with the goal of being able to recognize land rights and provide security of tenure to occupants in new and innovative ways (Deininge et al., 2006). Ethiopia is one of those countries that made such changes to improve tenure security through land registration and title certification in order to promote better land management and more investment (Hagos et al., 2002). It is also hoped that farmers may start using the certified land as collateral for bank loans (Federal Republic of Ethiopia, 2002). Certification of land title is also expected to help in reducing conflicts over land boundaries and user rights among farmers (Birhanu and Feyera, 2005).

Certification programs have been under implementation in Tigray, Amhara, Oromia and Southern regions (FAO, 2002). The Tigray approach was the first and pioneer to issue certificates for all land holdings in the region (Ethiopia Land Tenure and Administration Program, 2006). These certificates record the name of the landholder, the size of the holding and the names of the neighbors on each of the four sides of the field however, no mapping of fields has been done (Action Aid Ethiopia, 2006). The costs were low and affordable because only local tools were used in demarcation and measurement of plots that only staffs with very limited training were organizing the work while strong local participation in the implementation was required (Taye, 2006).

Land registries were established at village and district levels in form of hand written registry books (Heyi, 2012). The land registration and certification program of Soddo Zuria District has primarily focused on the demarcation, measurement and certification of individual agricultural land. Temporary and primary landholding certificates are given to peasants since 2005 -2010 (Qoricho, 2011). Presently, the land degradation is Soddo area is greatly manifested with subsequent physical, biological and chemical degradation threatening the food security of rural households (Dagnew et al., 2009). The study aimed to analyze the impact of rural certification on farmers' investment for soil and water conservation practices in Soddo Zuriya Woreda.

2. MATERIAL AND METHODS

The present study was carried out in Soddo Zuriya Woreda in Wolaita Zone, Southern Nations Nationalities and Peoples Region State located at about 390 km on the main road from Addis Ababa situated in latitude of 6^0 49′ N and longitude of 37^0 45′ E. The total area of the Woreda is 481 Km^2. Soddo Woreda is characterized by moderate to cool sub highland climate in which there is severe land degradation. The mean annual minimum and maximum temperature of the area ranges from 15 ^{0}C - 20^{0}C (EEA/EEPRI, 2002). An area of 95% of the land lies in the Woiyna Dega, which is mid-altitude ranges from 1500 and 2500 m.a.s.l and Dega is high altitudes above 2500 m.a.s.l in respective climatic zones.

The average annual rainfall of the study area is about 1200 mm. According to Ayele, (2008), the area endowed with a vast natural forest cover until the turn of the 20th century. However, with high population growth, expansion of agriculture, and

dependence on wood fuel for domestic energy consumption, the natural forest land has degraded over the years. Presently, scattered natural forests and state-owned plantations cover about 11% of the land in the Woreda/district with left over indigenous broad-leaved trees such as *Cordia Africana and Millettia fruginea* species as shade in the enset-coffee gardens. The dominant soil types in the area are vertisols and Nitosols (Pound and Jonfa, 2005).

Nitosols are brown or reddish-brown soils which mainly occur in sub-moist to humid agro-ecological zones. These soils are highly weathered, moderately fertile characterized by high concentrations of nutrients and organic matter in the top few centimeters of the soil horizon. They are well drained, but are vulnerable to erosion and leaching. Soddo Zuriya is one of the most densely populated areas in the country with an average population density of about 511 people per square kilometers (Pound and Jonfa, 2005).

According to CSA, (2007), there are about 163,771 rural populations of which 80,525 were male and 83,246 were females in composition. The people of Soddo Zuriya belong to the Wolaita ethnic group. The agricultural production system in the study area is crop-livestock mixed. The crop-livestock mixed production system is the predominant system farmers in the area struggling to make a living from the subsistence farming system. Basically, what is termed as the Enset farming system? According to Rahmato, (2007), Enset farming system involves the dynamic integration of Enset and other root crops (taro, sweet potato and other tubers) with cereal crops in a regime of intensive cultivation.

Data Collection and Methods

Both primary and secondary data were used for analyze information which includes structured interview, informal interview, focus group discussion and field observation. The primary data sources are farmers' household survey, key informants including development agents and experts at various levels and focus group discussant, secondary data from documents, records and reports of government organizations at regional, Zonal and Woreda level s and non-government organizations.

Sampling Technique

Multistage sampling techniques were used to determine the number of sampling households. Primarily, the representative district/Woreda was selected purposively based on years of implementation land certification since the year 2005. The second stage three Kebeles selected randomly those representatives Kebeles which comprised more than 70% of households are certified before 2007. The names of selected households in respective Woreda were triangulated with the book of registrar for land certification at Woreda/district level. A total of 149 heads of household respondents were selected systematically using probability proportional to size from the identified three Kebeles namely Damot waja, Delbo wogene and Waraz lasho respectively.

The sample size was determined by taking different factors such as research cost, time, and availability of transport facility. Systematic sampling method was chosen as the preferred sampling technique for this study because the sample units are spread at fixed interval throughout the populations. The number of sample respondents in each rural Kebeles is presented (Table 1).

Structured interview was used to collect data at sample households' level by structured questionnaire. The household survey focused on household characteristics, their perception on land certification and registration in providing tenure security and land management practices by the farmer before and after the intervention were systematically collected and summarized. The questionnaire was pre-tested before the actual conduct of the interview using 5-6 households identified randomly in each site and revised.

Six focus groups discussion a small group comprising five to eight members of the community were interviewed using a semi-structured check list was conducted in each study Kebeles to address issues related to tenure security and land certification and registration that may not have been adequately captured during formal survey. Separated focus group categories including women, elders and youth were used for the purpose of freely expression and collection of relevant data their feelings and aspirations.

Key informants' interviews were carried out including government experts at different level, farmers and Kebele land administration committee from different disciplines. The key informants were selected to get a deeper understanding of the farming community because of their first-hand knowledge and information about the topic and the area.

Table 1 Number of sample respondents in each rural Kebeles

No.	Name of Kebele	Total HHs in Kebele	Size of sample population
1	Damot waja	1012	51
2	Delbo wogene	650	33
3	Waraz lasho	1304	65

	Total	2966	149

Sources: Kebele Administration office April, 2012

Data analysis

After the completion of data collection, the data were coded and entered into statistical package for social science in SPSS version 21 to computer program for analysis and interpretation. Both descriptive and econometric tools were used to analyze the data from farmers. The important statistical measures that were used to summarize and categorize the research data were means, percentages, frequencies, standard deviations, chi-square and t-test. The degree of association or correlation between two variables X and Y was answered by the use of correlation analysis (Gomez and Gomez, 1984).

3. RESULTS

Impact of Rural Land Certification for Investment on Soil and Water Conservation Activities

Table 2 shows household characteristics of 149 respondents used in the present study of which majority of them are male headed households accounting 85.9% and the remaining 14.1% are female headed households. With respect to marital status the respondents accounting 86.6 % are married, 6.7% are widowed, 5.4 % are divorced and 1.3% is single as unmarried. Only 21 household respondents accounting 14.4% can read and write. Table 2 also shows that out of 149 household heads 21 household heads those accounting 14.4% can only read and write without attending any formal education; while 71 of respondents accounting 47% are not educated, 38 household heads accounting 25.5% attended elementary or primary school and the remaining 19 household heads accounting 12.8 % have attended secondary school.

Table 2 Descriptive Statistics of household characteristics (n = 149)

Variables	Frequency	Percentage
Education level		
No education	71	47.7
Can read and write	21	14.4
Primary (1-6)	38	25.5
Secondary (7-12)	19	12.8
Marital status		
Married	129	86.6
Single	2	1.3
Widowed	10	6.7
Divorced	8	5.4
Sex		
Male	128	85.9
Female	21	14.1

Table 3 shows age group of household respondents those between 16-45 accounting 48.99%, 46-64 accounting 46.3 % and above 64 years accounted 4.69% respectively. The overall average age of the rural household respondent's is 44.76 years which ranges between 26 -76 years. Majority of the respondents of the respondents accounting 95.3% fall in within the working age group between 16-64 years as the mean age range is 44.76 having mean family size of 6.43 owing mean land holding of 0.54 ha.

Table 3 Descriptive Statistics of household characteristics on age and family size (n = 149)

Variables	Min	Max	Mean	Std. Deviation
Age	26	76	44.76	10.73
Family size	2	14	6.43	1.974
Farm size	0.13	2	0.54	0.381
Total Livestock Unit	0	6.5	2.34	1.465

Table 4 shows years of land registry with status of land certification for ownerships obtained through primary land certification book. Out of the 149 sampled households those accounting 21.5% obtained certificates for land ownership in 2005, 27.5% in 2006,

34.9% in 2007, 9.4% in 2008 and 6.7% in 2009 respectively. Most households accounting 86.6% are issued joint landholding certificates certifying by the name of both husband and wife mentioning with other family members with corresponding plot size. Specifically, women family heads accounting 12.1% landholding certificates were issued using their own names. In case of polygamy, woman is issued separate joint landholding certificates with their husband.

Table 4 Description of the land registration and certification of Sample households

Tools	Responses	Frequency	Percent
Whether the land is registered or not	Yes	149	100
	No	0	0
Level of certificate holding	Primary	149	100
	Secondary	0	0
Year the respondent get land certificate	2005	32	21.5
	2006	41	27.5
	2007	52	34.9
	2008	14	9.4
	2009	10	6.7
To whom does the certificate issued	In their own names	2	1.3
	By the name of the wife	18	12.1
	Jointly by husband and wife	129	86.6

Table 5 shows gender-based proportion response for the adaptation of soil and water conservation activities with respect to types of technologies employed through soil bund construction and afterwards tree planting. The chi-square analysis for three factors shows systematic association between gender and adoption of conservation practice that were indicated as statistically significant at 1% level.

Male-headed households are more likely to make the adoption of soil bund on farmlands than female-headed households which are statically significant. Similarly, Male-headed households are more likely to make the adoption of planting trees on farmlands than female-headed households However, farmer gender-based decision of tree planting trees on farmland even though there is no significant difference between as an adopter and non-adopter.

Table 5 Gender based association with adoption of soil and water conservation practices (n = 149)

Gender	Soil bund construction		$\chi 2$ –value	p
	Adopter (%)	Non adopter (%)		
Male	92	73.5	9.327	.002***
Female	8	26.5		
Total	100	100		
Gender	Tree planting		$\chi 2$ –value	p
	Adopter (%)	Non adopter (%)		
Male	83.0	90.2	1.547	.214Ns
Female	17.0	9.8		
Total	100	100		

Source: Survey data (2012)

***significant at 1% level, Ns: Non- significant.

Table 6 shows the correlation of age of land owners' households with respect to the implementation of both physical and biological land conservation interventions. The mean age for adoption of soil bund construction is 42.81 years. The t-test was statistically significant for mean age difference between adopters and non-adopters of soil bund construction at 1% significance level. Result in Table- 6 also shows that the mean age for adoption of tree planting is 44.5 years.

The age difference among the house holds does not affect for the adoption and non-adoption of tree planting with non-significant difference at 1% of level of confidence. The result of t-test showed that there was statistically significant mean age difference between adopters and non-adopters of soil bund construction at 1% significance level.

Table 6 Association between ages of households with adoption of SWC practices (n = 149)

Variables		Soil bund construction		t	P
		Adopter	Non adopter		
Age	Mean	42.81	49.00	3.424	.001***
	SD	8.68	13.18		
Variables		Tree planting		t	P
		Adopter	Non adopter		
Age	Mean	44.50	45.34	.471	.639 ns
	SD	11.16	10.15		

Source: Survey data (2012)

***significant at 1% level, ns: Non- significant

Table 7 shows the relationships of mean family and land holding sizes with respect to the adoption and non-adoption for soil bund construction and tree planting by rural farmers. The minimum and maximum size of landholding in study area ranges between 0.13 and 2 ha. Hence, the mean area of land holding is 0.54 ha in which households accounting 91.28 % cultivates less than 1 ha of land, while households cultivating more than 1 ha accounted for only 8.72 %.

Result also shows the relationship of adoption and non-adoption of soil bund construction and tree planting with respect to mean family size and land size that is statically non-significant at 5% level of degree of confidence. Result also shows the relationship of adoption and non-adoption of tree planting with respect to mean family size and land size that is statically significant at 5% level of degree of confidence. Conversely, result of the present study also shows the relationships between adoption and non-adoption of total livestock unit with respect to mean family size and land size that is statically significant at 1% level of degree of confidence.

Table 7 Association between family size and economic variables with adoption of SWC (n= 149)

Variables		Soil bund construction		t	P
		Adopter	Non adopter		
Family size	Mean	6.58	6.12	-.133	.790 ns
	SD	1.897	2.108		
Farm land size	Mean	0..50	0.46	-.733	.185 ns
	SD	0.37	0.31		
Total Livestock Unit	Mean	2.51	1.99	-2.076	. 040**
	SD	1.528	1.269		
Variables		Tree planting		T	P
		Adopter	Non adopter		
Family size	Mean	6.55	6.26	0.706	0.391 ns
	SD	1.994	1.949		
Farm land size	Mean	0.54	0.41	-2.148	. 033**
	SD	0.387	0.269		
Total Livestock Unit	Mean	2.78	1.70	-4.720	.000***
	SD	1.572	1.005		

Source: Survey data (2012)

***significant at 1% level, ** significant at 5% level

Table 8 shows the relationships between education level of the households with respect to implementation of physical and biological soil and water conservation. Majority households better adopt soil bund construction whether they are educated or not which is not statically non-significant. Table 8 shows also shows that there is difference whether educated or not to employ tree planting which statically significant.

Table 8 Association between level of education of households with adoption of SWC Practices (n= 149)

Education level Level	Soil bund construction		Tree planting	
	Adopter (%)	Non-Adopter (%)	Adopter (%)	Non-Adopter (%)
No education	67.6	32.4	47.9	52.1
Read and write only	61.9	38.1	52.4	47.6
Primary (1-6)	71.1	28.9	76.3	23.7
Secondary (7-12)	63.8	36.8	73.7	26.3
Chi-square	$\chi 2 = .668$	P = .881ns	$\chi 2 = .10.413$	P = .015**

Source: Survey data (2012)

** Significant at 5% level, ns=: Non- significant

Table 9 shows the experience of the rural community for the implementation of various land management practices including drainage ditches, soil bund, contour ploughing, distribution of manure, application of compost, application of inorganic fertilizer and planting of trees before and after the land certification program is being carried out. The proportion of the house hold respondents who employed all technologies of biological and physical soil and water conservation measures drainage ditches, soil bund, contour sloughing, distribution of manure, application of compost, application of inorganic fertilizer and planting of trees are significantly higher after the land certification program than before. The chi-square result ($\chi 2$=29.717and P< 0.01) shows there was statistically high significant difference before and after land certification.

Table 9 Soil and land management practices before and after land certification in percent

Variable	Before land certification		After land certification		X^2
	Yes	No	Yes	No	
Land management practices	77.9	22.1	94.6	5.4	29.717***
Drainage ditches	28.2	71.8	53.7	46.3	7.4***
Soil bund	40.9	59.1	67.1	32.9	15.8***
Contour ploughing	43.6	56.4	61.1	38.9	62.328***
Application of compost	34.2	65.8	56.4	43.6	40..968***
Farm yard manure	61.1	38.9	79.9	20.1	59.935***
Planting tree	42.3	57.7	59.1	40.9	44.554 ***
Inorganic fertilizer	50.3	49.7	72.5	27.5	15.232***

Source: Survey data (2012)

****significant at 1% level*

4. DISCUSSION

Impact of Rural Land Certification on Farmers' Investment for Soil and Water Conservation Activities

Result of the present study showed that the rural land ownership is mainly held by men households accounting 85.9% while the remaining 14.1% are female headed households. The gender imbalance has impact on the land management practices. In Soddo area the gender imbalance for land ownership has significant impact contribution on extent of investment on the soil and water conservation practices. Similarly result of the present study indicated that majority of household respondents accounting 86.6% are married which indicate joint land ownership certificate greatly contribute for better investment by both women and men family heads on soil and water conservation activities.

Level of education and better awareness on land degradation has created better management opportunity for investment on soil and water conservation activities. Findings of our study indicated that 21 household heads accounting 14.4% can only read and write passed through formal education; while 71 of respondents accounting 47% are not educated. Findings of the present study indicated that formal level of education and land ownership has great impact to employ land restoration activities.

Similar study in Tigray region of Ethiopia by Deininger and Jin, (2006) indicated that the land certification program supported female heads for land ownership for better investment on soil and water conservation practices. They also indicated that the land certification program supported female households to have better opportunity to rent out their piece of land. Females are believed to have been more tenure insecure than their male counterparts in the previous regime. At the time of the Imperial regime, women were hardly ever being recognized as landowners.

A previous study in 2000 also indicated that women households have better access land only through marriage and inheritance from their parents. Equal access to land means that society's members have equal opportunity to access land that gender, caste are not used to deny a person or group land rights. A previous study also indicated that many women of rural Ethiopia and Africa have had almost no land rights in practical and remained as major problems in succession or inheritance.

Result of the present study also indicated that majority of rural householder accounting 95.3% fall in within the working age group between 16-64 years as the mean age range is 44.76. The land holding for mean family size was 6.43 members which is on average 0.54 ha. The mean land size is very small which is about 0.5 ha because of there is high population density per unit area in Soddo Zuria that the rural land certification program is crucial for the implementation of soil and water conservation activities. Result of present study indicated that as age of farmers increases the likelihoods to construct soil bund decrease, thus age difference negatively affected soil bund construction. This implies older farmers lack required power to construct soil bund conservation practices.

A previous study in 2011, indicated that land tenure security is not a precondition for farmers' decisions on soil conservation practices" because, according to him availability of labor at household level and education levels also affects the decision about soil and water conservation. The land ownership modality and gender based and joint land certification holding is quite important for the proper employment of family labor. Both female and male family members are responsible and create assurance of joint land certification for better employment of soil and water conservation practices and adoption of land management practices.

Result of the present study indicated that most households accounting 86.6% are issued joint landholding certificates by the name of both husband and wife mentioning the name of other family members and the plot size. Even though the land registration and certification program was started from 2005 in the zonal responsible institution have implemented the land certification within five years with the application of simple technology and bureaucratic procedure given the rural community have better awareness and perception on the assurance land property right.

A study by Crewett et al., (2008) indicated that land tenure system and land user rights are granted to both men and women rural farmers. Their study has also indicated that the land tenure allows them the right to lease out, inherit, exchange and donate land to their relatives. However, in practice female land holders face challenges when they attempt to claim their holding and use rights. This assertion is the same as studies by that shows divorced women lack security to land rights, due to numerous exceptions which strictly limit their rights. A previous study in 2008 indicated that divorced women lack security to land rights due to numerous exceptions which strictly limit their rights for land ownerships and inheritance of the property.

The employment and adoption of both physical and biological measures of soil and water conservation practices are directly linked with the gender-based land ownership which is related to the difference on physical labor and power of men and women. Result of the present study indicated that the chi-square for three factor analysis showed there is systematic association between gender and adoption of conservation practice which was statistically significant at 1% level. The proportions of male-headed households do make the adoption of soil bund physical conservation measure on farmlands and their plots than female-headed households often do which is tested statically significant.

Result of our study is also showed that there is no significant difference between category of adopter and non-adopter on gender-based farmers' decision for tree planting trees on farmland. The result of t-test showed that there was statistically significant mean age difference between adopters and non-adopters of soil bund construction at 1% significance level. Findings of our study also showed that the adoption of physical soil measures is highly dependent on the extent of labor force employed by men land owners than by female households.

Finding of our study showed that households mean age is 45 years for better employing and applying of physical conservation measures through soil bund construction to control erosion on degraded lands. The adoption and non-adoption of physical and biological soil and water conservation measures are related with the mean age of households that as farmer age increases the likelihoods to construct soil bund decrease. Thus, age as one variable affects soil bund construction practices which is correlated negatively. This implies older farmers lack labor that is required to construct soil bund.

The mean age difference of the households in Soddo area does not affected by farmers experience for the employment of biological conservation by tree planting, which is non-significant with the statically test at 1% probability confidence. A previous study in 2006 indicated that there are positive impacts of land tenure security on investment for soil and water conservation in rural areas in China.

Findings of our present study indicated that most of the agricultural land in the study area has so far been subdivided in to the smallest land holdings and continues to be an extremely scarce asset. The adoption and non-adoption of both physical soil and

water conservation activities is not related with the family size rather it is impacted by the land size owned by the house holds. However, the adoption and non- adoption of biological water conservation activities is related with the mean family size.

The mean family size of the households has not hampered for the employment of both biological and physical conservation measures while the mean land size of the households has affected the employment of both biological and physical conservation measures which implies land is scarce resources farmers that are motivated by the size of the land, they owe to employ the soil and water conservation measures for better land management.

Similar studies in Ethiopia indicated that land certification encouraged the promotion of soil and water conservation measures on private and small holders land which is implemented with full interest for sustainable management of land. A study by Adal, (2003) also indicated that the rural land certification program is a process that is perceived rural communities which prevailed unjust and failure to honor certificates on as it created great skepticism among farmers who initially believed that certification was just another politically motivated which disagree with the findings of our study.

Findings of the present study indicated that the implementation of tree planting is highly dependent the level of education of the households that insured to accept technologies and innovation through education and extension system. Conversely, the implementation of soil bund construction is not dependent the level of education of the households that insured to accept technologies and innovation through education and extension system rather the rural community is well aware of the importance of physical soil and water conservation measure inherently important as land management practice which is not dependent of the level of education.

Findings of the present study also indicated that the rural land certification and registration program has initiated the rural community for better investment on both physical and biological soil and water conservation activities basically on the technologies including drainage ditches, soil bund, contour sloughing, distribution of manure, application of compost, application of inorganic fertilizer and planting of trees in which the land certification has brought significant impact on land investment.

Result of the present study showed that the proportion of the house hold respondents who employed all technologies of biological and physical soil and water conservation measures benefited using drainage ditches, soil bund, contour sloughing, distribution of manure, application of compost, application of inorganic fertilizer and planting of trees that are significantly higher after the land certification program than before.

The chi-square result showed that there was statistically high significant difference before and after land certification. The land investment in which the households are willing to invest on the private land is higher than the communal lands. Rural communities perceived the significance of land certificates in providing tenure security and improved of willingness to participate on soil and land management practices observed after certification in Soddo area. A study by Gebremedhin and Swinton, (2003), indicated that tenure security not associated with short term investments like soil bund construction and tree planting which dis agree with findings of the present study.

5. CONCLUSION

Findings of our study indicated that the rural land ownership is mainly held by men households that the gender imbalance has impact on the land management practices. In Soddo area the gender imbalance in land ownership has significant impact contributing to the investment on the soil and water conservation practices. Similarly, the level of education and better awareness on severity of land degradation has created better management opportunity and options for investment on soil and water conservation activities.

This study indicated that women households accessed land only through marriage and inheritance for instance, women could inherit land from their parents or deceased husbands, but they could not own land in their own right. The younger mean age of the household at 45 years is better for application of physical soil and water conservation measures through soil bund construction for the control of erosion on degraded lands.

The adoption and non-adoption of physical and biological soil and water conservation measure is related with the mean age of households that as farmer age increases the likelihoods to construct soil bund decrease, thus age affects soil bund construction practices and experiences negatively. The rural land certification and registration program has initiated the rural community for better investment in both physical and biological soil and water conservation activities basically on the technologies including drainage ditches, soil bund, contour sloughing, distribution of manure, application of compost, application of inorganic fertilizer and planting of trees in which the land certification has brought significant impact on land investment

To enhance farmer adoption/participation in long term soil and land management practices such as tree planting on private plot, factor like, farm size, certification and livestock ownership should give to more emphasis besides tenure security. In general,

the rural land certification program has significant impact for the employment for sustainable soil and water conservation and tree planting intervention on private small holder land than communal land. Land degradation is sever threat to the economic development of Ethiopia in which the ever increasing human population especially youth need more new land for rural livelihood development. Tenure security is one of the prime priorities for Ethiopia for ensuring sustainable land restoration activities for meeting the sustainable development goal-15 which makes land suitable for life.

Informed consent

Not applicable.

Ethical approval

Not applicable.

Conflicts of interests

The authors declare that there are no conflicts of interests.

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Data and materials availability

All data associated with this study are present in the paper.

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